The drawings show:

Figure 1 a partially sectioned side elevation through a profile joint produced by the device according to the invention;

Figure 2 plan view of the profile joint according to Figure 1;

Figure 3 another embodiment of the invention;

Figures 4a and 4b
an embodiment of a securing plate in the device according to the invention;

Figure 5 another embodiment of the invention;

Figures 6a to 6c
several views of a template part of the device according to the invention;

Figure 7 the view according to arrow B in Figure 1;

Figure 8 schematic plan view of a clamping screw of the device according to the invention;

Figure 9 side elevation of the clamping screw in the device according to the invention.

In Figures 1, 2 and 7 a joint between a first profile rod 1 and a second profile rod 2 fitting by an end face against a longitudinal side 100 of the first profile rod 1 by means of an appropriate device for joining these profile rods 1, 2 is illustrated.

The profile rods 1, 2 are constructed in known manner per se, e.g. of lightweight metal and with identical cross-section, wherein there is a substantially square outline and on each of the four longitudinal sides of the profile rods 1, 2 there is a longitudinal groove 10 or 20 of undercut construction and a continuous longitudinal bore running centrally in the region of the central longitudinal axes L1, L2 of the profile rods 1, 2 is formed which is identified on the profile rod 2 by reference number 21 but is not designated in more detail on profile rod 1.

To fasten the second profile rod 2 fitting by an end face against the longitudinal side 100 of the first profile rod 1 a clamping screw 3 is used which is illustrated in more detail in Figure 9.

The clamping screw 3 comprises a screw head 32 and a threaded shaft 30 which extends in the direction of the longitudinal axis S of the screw and depending on the embodiment is constructed with a standard thread or a self-tapping thread. The diameter of the threaded shaft 30 is chosen so that screwing into the longitudinal bore 21 of the profile rod 2 is enabled.

Moreover, in the region of transition of the screw head 32 to the threaded shaft 30 of the screw 3 a collar 31 extending transverse to the longitudinal axis S of the screw 3 is provided which has a greater diameter than the screw head 32 and the threaded shaft 30. Along the outer perimeter of this projecting collar 31 a toothed structure visible in the plan view of Figure 8 is constructed the flanks of whose teeth extend parallel to the longitudinal axis S of the screw 3 and whose profile is constructed in the manner of a gear wheel.

To produce the joint illustrated in Figure 1 between the first profile rod 1 and the second profile rod 2, in a first step the clamping screw 3 explained above is introduced by its head region, i.e. screw head 32 and collar 31 with toothed structure 310 into the undercut longitudinal groove 10 of the first profile rod 1 facing the profile rod 2 so that the threaded shaft 30 of the clamping screw 3 projects out from the undercut longitudinal groove 10 in the direction of the second profile rod 2 to be fastened.

The diameter of the screw head 32 and in particular of the projecting collar 31 formed thereon is chosen so that after introducing the clamping screws 3 into the undercut longitudinal groove 10 of the profile rod 1 in the manner explained the screw head 32 with the collar 31 formed thereon engages behind the undercut longitudinal groove 10, i.e. parts of the perimeter of the collar 31 form contact surfaces which fit against the upper webs 12 bounding the undercut longitudinal groove 10 on the longitudinal side 100 of the profile rod 1 and prevent the clamping screw 3 being lifted in the direction of the arrow P in Figure 1 out of the undercut longitudinal groove 10 of the profile rod 1.

The second profile rod 2 to be fastened on the profile rod 1 is now set up flush, as can be seen in Figure 7, with the longitudinal side 100 of the first profile rod 1 and this is done in such a way that the threaded shaft 30 of the clamping screw 3 projecting out of the undercut longitudinal groove 10 of the first profile rod 1 is in alignment with the longitudinal bore 21 inside the second profile rod 2. The desired fastening of the second profile rod 2 to the first profile rod 1 can now be effected by screwing the threaded shaft 30 of the clamping screw into the longitudinal bore 21 of the second profile rod 2. For this purpose the second profile rod 2 can be constructed as illustrated in the drawings with a threaded sleeve 7 acting in

conjunction with the threaded shaft 30 of the clamping screw 3, this sleeve being inserted into the longitudinal bore 21, or the threaded shaft 30 is constructed with a self-tapping thread so that the clamping screw 3 can be screwed directly into the second profile rod 2.

The turning of the clamping screw 3 about its longitudinal axis S needed for screwing the clamping screw 3 into the longitudinal bore 21 of the second profile rod 2 in the described installation position, in which the screw head 32 is located inside the undercut longitudinal groove 10 of the first profile rod, using conventional turning tools is not readily achievable.

The turning movement of the clamping screw 3 to achieve the desired fastening of the second profile rod 2 to the first profile rod 1 can, however, be carried out by means of the toothed structure 310 constructed on the perimeter of the collar 31 when a correspondingly constructed turning tool is applied to the toothed structure and brought into active engagement with it as likewise illustrated in Figure 1.

A rod-shaped key tool with an end 61 bent at right angles serves as turning tool. At least at its free end designated by the reference number 60 in Figure 1 this has a toothed structure corresponding to the toothed structure 310 of the clamping screw 3. As illustrated schematically in Figure 8 this toothed structure is suitable for engaging in the toothed structure 310 of the collar 31 in the fashion of toothed wheel gearing so that on turning the turning tool 6 in the direction of the arrow D2 by engagement in the toothed structure 310 of the clamping screw 3 any desired turning in the direction of the arrow D1 and vice versa can be achieved. For this purpose, as can be seen in the illustration in Figure 1, the turning tool 6 is introduced via a suitable longitudinal groove 20 of the second profile rod 2 and set by its end 60 bearing the toothed structure in the base 11 of the groove of the undercut longitudinal groove 10 of the first profile rod, this being in a position in which it engages with the toothed structure 310 of the clamping screw 3, i.e. undergoes active engagement with the latter. On turning the turning tool 6 about its longitudinal axis L3 the desired rotation of the clamping screw 3 for achieving the fastening of the profile rod 2 to the profile rod 1 can then be carried out.

In the same fashion, as illustrated in Figure 1, an existing fastening of the second profile rod 2 to the first profile rod 1 can be undone again by renewed use of the turning tool 6 to screw the clamping screw 3 out of the second profile rod 2.

In any case a joint between the first profile rod 1 and the second profile rod 2 is obtained which after completion is almost invisible from the outside since only the clamping screw 3

establishes the joint and this is almost invisible from the outside arranged inside the undercut longitudinal groove 10 of the first profile rod and covered by the second profile rod 2.

In order to facilitate the assembly of a joint constructed in this way between the first profile rod 1 and the second profile rod 2 by means of the clamping screw 3 a securing plate 4 is, moreover, provided in the exemplified embodiment shown in Figures 1, 2 and 7. This is set in place on the end face of the second profile rod 2 before establishing the joint between the first profile rod 1 and the second profile rod 2.

The securing plate 4 has a through hole 40 constructed in its central region through which the clamping screw 3 is led by its threaded shaft 30 for screwing into the second profile rod 2. Viewed in the direction of the longitudinal axis L1 of the first profile rod the securing plate 4 is of such a width that it fills the width T remaining between the webs 12 of the undercut longitudinal groove 10, i.e. it is arranged between the two webs 12. Moreover, both end regions lying in the longitudinal direction of the first profile rod 1 end flush with the second profile rod 2 so that the securing plate 4 does not protrude over its contour.

In addition, these two ends lying in the longitudinal direction of the first profile rod 1 are constructed with a projection 42 angled away in the direction of the second profile rod 2 which on the upper side project out of the longitudinal groove 10 of the first profile rod over its longitudinal side 100 and engage in form-fitting manner into the respective undercut longitudinal grooves 20 of the second profile rod 2, in this case exactly between the webs 22a and 22b bounding the longitudinal grooves 20 (see Figure 2).

Thus, the securing plate 4 engages by its two angled projections 42 in form-fitting manner in the second profile rod 2 while with the rest of its area it engages in form-fitting manner in the first profile rod 1 between the two webs 12 which has the result that twisting of the profile rod 2 about its longitudinal axis L2 on setting it up on the profile rod 1 and screwing the clamping screw 3 in is ruled out. On the contrary when a securing plate 4 is used the profile rod 2 is automatically held in the desired angular orientation with respect to the profile rod 1 which also extraordinarily facilitates assembly.

Furthermore, to facilitate assembly further guide bores 41a, 41b are arranged in the securing plate 4 on each side of the through hole 40 for the clamping screw 3. At their lower end these guide holes leading out into the longitudinal groove 10 of the first profile rod 1 communicate with the toothed structure 310 of the clamping screw 3, i.e. the toothed structure projects over the extension of part of the perimeter of the guide bore 41a or 41b. The diameter and

form of the guide bores 41a, 41b are simultaneously of such a size that the turning tool 6 can be inserted into the guide bore 41a or 41b according to accessibility and in doing so comes into active engagement with the toothed structure 310 of the clamping screw 3. At the same time, however, due to guidance inside the guide bore 41a or 41b the tool is secured against slipping and loss of the active connection to the toothed structure 310. In particular the form of the guide bores 41a, 41b is also chosen so that the turning tool 6 is automatically held at an orientation advantageous for actuation in which the longitudinal axis L3 of the turning tool 6 subtends an angle of 5 to 20° with the longitudinal axis L2 of the second profile rod 2 (in connection with this see Figure 1).

An embodiment that has been modified with respect to the exemplified embodiment in Figures 1, 2 and 7 is illustrated in Figures 3, 4a and 4b. In this embodiment substantially the same parts as already shown in the exemplified embodiment in Figures 1, 2 and 7 are used, but in the region surrounding the through hole 40 for the clamping screw 3, in contrast with the first exemplified embodiment, the securing plate is not constructed with such a width that it engages between the two webs 12 of the first profile rod 1. On the contrary it is of wider construction by comparison as a result of which this region in the illustrations in Figures 4a and 4b is identified by the reference number 43 and surrounds the through hole 40 for the clamping screw 3. The dimensions of this widened region 43 are chosen so that the securing plate 4 also like the screw head 32 with collar 31 of the clamping screw 3 already is introduced into the undercut longitudinal groove 10 of the first profile rod and then engages by the widened region 43 behind the undercut longitudinal groove 10 coming to rest against the two webs 12. Thus, as can be seen from the circumference of the collar 31 shown by dotted line in Figure 4a, when installing a securing plate 4 constructed in this way the collar 31 of the clamping screw 3 does not fit directly against the webs 12 of the first profile rod 1 to bring about the fastening of the second profile rod 2 but rather via the widened region 43 of the securing plate 4, which accordingly forms a support and pressing surface for the clamping screw 3, braces itself against the webs 12 of the first profile rod 1. By this means the strength of the joint brought about between the first profile rod 1 and the second profile rod 2 by the clamping screw 3 can be increased since the securing plate 4 due to its widened region 43 forms a larger contact and clamping surface for the clamping screw 3.

All other parts of the securing plate in Figures 4a and 4b correspond to those of the exemplified embodiment in Figures 1, 2 and 7 and are, therefore, nor explained again.

A third possible embodiment of a profile joint between the first profile rod 1 and the second profile rod 2 by means of the clamping screw 3 is illustrated in Figure 5.

In this exemplified embodiment the clamping screw 3 can be screwed directly, i.e. without interposing a securing plate 4, into the longitudinal bore 21 of the second profile rod 2 by means of the turning tool 6, wherein the collar 31 bearing the toothed structure 310 is braced against the webs 12 bounding the undercut longitudinal groove 10 of the profile rod 1.

In order to facilitate the desired turning of the clamping screw 3 by means of the turning tool 6 a template part 5 is used which is illustrated in more detail in Figures 6a to 6c. The template part 5 comprises a body 50 like a sliding crank block which is insertable in longitudinally displaceable fashion into the undercut longitudinal groove 10 of the first profile rod 1, wherein its underside 500 lies on the base 11 of the undercut longitudinal groove 10 of the first profile rod 1. In this position the upper side 501 of the template part 5 projects out of the longitudinal groove 10 of the first profile rod 1 between the webs 12, wherein lateral recesses 51 accommodate the respective free ends of the webs 12 of the undercut longitudinal groove 10 of the first profile rod 1.

After the template part 5 has been inserted into the undercut longitudinal groove 10 of the first profile rod 1 it is slid along the longitudinal axis L1 of the first profile rod 1 until it comes to rest against the positioned profile rod 2 to be fastened. In doing so since the profile rods 1 and 2 are of similar construction the template part 5 due to its insertability into the undercut longitudinal groove 10 of the first profile rod 1 can also be introduced into the undercut longitudinal groove 20 of the second profile rod 2 facing the latter until it comes to rest against the wall of the profile rod 2 surrounding the longitudinal bore 21. As a result of this dual engagement, that is to say, on the one hand, in the undercut longitudinal groove 10 of the first profile rod and, on the other hand, in the undercut longitudinal groove 20 of the second profile rod the attached template part 5 again acts to prevent twisting of the second profile rod 2 relative to the first profile rod 1 during assembly.

Moreover, in the region of the template part 5 adjoining the end face 502 coming to rest against the second profile rod 2 a guide bore 52 running at a suitable angle is constructed. In the present exemplified embodiment the guide bore 52 is constructed at an angle of 5 to 20° emanating at approximately half the height of the end face 502 from the upper side 501 of the body 50 of the template part 5 and in the case of the end-face fit against the profile rod 2 shown in Figure 5 communicates with the toothed structure 310 of the clamping screw 31. It is accordingly possible as illustrated in Figure 5 to insert the turning tool 6 into the guide bore 52 as a result of which it then in the desired and suitable position moves into active engagement with the toothed structure 310 of the clamping screw and by turning the turning

tool 6 the desired rotation of the of the clamping screw 3 can be carried out to produce the joint between the first profile rod 1 and the second profile rod 2. This rotation of the turning tool 6 can be initiated without difficulty through the bent end region 61 of the latter.

In order to hold the template part 5 at the desired position during use it is further constructed with a fixing device in the form of a locking screw 530 with handle 531 which can be screwed in and out of a corresponding bore 53 passing through the body 50 and can be screwed out for fixing the template part 5 on the underside 500 of the template part 5 as a result of which fixing it on the base 11 of the undercut longitudinal groove 10 of the first profile rod 1 is effected. This can be removed again by actuation in the opposite direction on completion of actuation of the clamping screw 3.

It may further be gathered from Figure 6c that the body 50 of the template part 5 is advantageously constructed with a slightly smaller width than the width T formed between the two webs 12 (see Figure 2) so that it can be inserted without difficulty into the undercut longitudinal groove 10. By slight twisting relative to these insert positions indicated by dotted lines in Figure 6c into the position illustrated by solid lines the body engages by its lateral recesses 51 behind the webs 12 and wedges itself inside the undercut longitudinal groove 10 so that the template part 5, if need be with the aid of the locking screw 530, is ready for use. Accordingly, introduction of the template part 5 can be carried out not only from the end face of the first profile rod 1, which when the profile rod 1 is of great length can sometimes be a long distance from the desired joint with the profile rod 2, but the template part 5 can also be inserted directly into the longitudinal groove 10 of the profile rod 1 in the immediate vicinity of the profile rod 2 to be connected and put to use.